WHAT IS CLAIMED IS:

1. A method for fabricating a semiconductor device comprising the steps of:

forming an opening in an insulation film;

forming an interconnection layer of Cu as a main material in the opening; and

concurrently injecting nitrogen gas and water to the surface of the interconnection layer buried in the opening.

2. A method for fabricating a semiconductor device according to claim 1, further comprising, after the step of concurrently injecting the nitrogen gas and the water, the step of

forming a diffusion preventing film for preventing the diffusion of the Cu on the insulation film and the interconnection layer.

3. A method for fabricating a semiconductor device according to claim 2, wherein

the diffusion preventing film is an SiC film or a silicon nitride film.

4. A method for fabricating a semiconductor device according to claim 1, further comprising, after the step of concurrently injecting the nitrogen gas and the water, the step of

applying hydrogen plasmas to the surface of the insulation film and the surface of the interconnection

layer.

5. A method for fabricating a semiconductor device according to claim 2, further comprising, after the step of concurrently injecting the nitrogen gas and the water, the step of

applying hydrogen plasmas to the surface of the insulation film and the surface of the interconnection layer.

6. A method for fabricating a semiconductor device according to claim 3, further comprising, after the step of concurrently injecting the nitrogen gas and the water, the step of

applying hydrogen plasmas to the surface of the insulation film and the surface of the interconnection layer.

7. A method for fabricating a semiconductor device according to claim 1, wherein

in the step of forming the opening, the opening containing a via hole and an interconnection trench formed in a region containing the via hole is formed.

8. A method for fabricating a semiconductor device according to claim 2, wherein

in the step of forming the opening, the opening containing a via hole and an interconnection trench formed in a region containing the via hole is formed.

9. A method for fabricating a semiconductor device

according to claim 3, wherein

in the step of forming the opening, the opening containing a via hole and an interconnection trench formed in a region containing the via hole is formed.

10. A method for fabricating a semiconductor device according to claim 4, wherein

in the step of forming the opening, the opening containing a via hole and an interconnection trench formed in a region containing the via hole is formed.

11. A method for fabricating a semiconductor device according to claim 1, wherein

in the step of concurrently injecting the nitrogen gas and the water, the water to be concurrently injected with the nitrogen gas is carbonated water or ozonized water.

12. A method for fabricating a semiconductor device according to claim 2, wherein

in the step of concurrently injecting the nitrogen gas and the water, the water to be concurrently injected with the nitrogen gas is carbonated water or ozonized water.

13. A method for fabricating a semiconductor device according to claim 3, wherein

in the step of concurrently injecting the nitrogen gas and the water, the water to be concurrently injected with the nitrogen gas is carbonated water or ozonized

water.

14. A method for fabricating a semiconductor device according to claim 4, wherein

in the step of concurrently injecting the nitrogen gas and the water, the water to be concurrently injected with the nitrogen gas is carbonated water or ozonized water.

15. A method for fabricating a semiconductor device according to claim 7, wherein

in the step of concurrently injecting the nitrogen gas and the water, the water to be concurrently injected with the nitrogen gas is carbonated water or ozonized water.